Space education activities at the Romanian Science Festival

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Abstract

Eastern European countries, in particular Romania, offer much fewer opportunities for science and space outreach and informal science education compared to the West. Romanian Science Festival was founded in 2018 with the aim of answering questions raised by the inquisitive minds of children all over Romania. In 2019, we reached over 20,000 people with our live events: open-air science festivals, space talks and astronomical observations. During the COVID-19 pandemic, we organised 58 live webinars of over 75 hours in total, one of the largest scientific resources in the Romanian language. Moreover, we visited 150 schools across the country, including rural areas, providing an opportunity for students to meet scientists online.

Space-related topics are a key focus of the science festival as they are not included in the Romanian school curriculum. That is why the resources in the form of the expertise and career orientation offered by our mentors are so valuable to the students. The topics we address include Astronomy (asteroids, black holes, extrasolar planets, etc.), Space Exploration, Satellite Design and Earth Observations. In 2021 and 2022 we organised the 'Space month' during which thousands of students had the opportunity to discover careers in space, participate in competitions, meet the only Romanian astronaut, Dumitru Prunariu, in celebrations of 40 years' of his space flight and a former NASA director of Astrophysics. Through mentorship, students discover opportunities to study and do research in astronomy. All these activities expose the public to the latest discoveries in the field, thus highlighting the importance of investing in fundamental research. This is just the beginning. The Romanian Science Festival story will continue because our team is determined to create a systemic impact in education. We will continue to add new chapters, stimulating the curiosity and imagination of people fascinated by science and space.

Keywords

astronomy, space education, science festival, webinars, meet-a-scientist

1. Introduction

With the mission to inspire, encourage and challenge children and people of all ages and from all walks of life to get to know and understand the world surrounding us, the Romanian Science Festival (RSF) team aims to provide an engaging platform for bringing together science enthusiasts. Drawing on two similar initiatives, RSF was established in the city of Timișoara, Romania, in 2018.

As part of the brain drain phenomenon, the last two decades have seen a massive emigration of young motivated Romanian scientists to the West. The RSF's main objective is to build bridges between the expertise within the Romanian diaspora and the educational system at home. For this purpose, RSF has a growing community of over 100 'mentors'[4], from the academic diaspora who interact directly with students. The mentors are researchers from top universities from all over the world: USA (MIT, Harvard, Chicago, etc), the UK (Oxford, Cambridge, Imperial Collage, Manchester, etc), the Netherlands, Switzerland, Sweden, Germany, Australia etc. RSF mentors have been involved in STEM outreach programs in the universities they have attended, so they already have experience in presenting science according to various levels of understanding.

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RSF also cultivates partnerships with local organisations, clubs, and educational institutions and develops new initiatives, workshops, and national projects to benefit STEM academic curriculum development.

Initially established as a two-day event focusing on an open-air science festival, RSF was faced with the impossibility of organizing the event in 2020 due to the pandemic. However, the new social context opened the door to new online initiatives which aimed to support online teaching and learning.

The main goals of RSF are:

(a) to offer high school students career models in the STEM fields

(b) to build links between the academic diaspora and the Romanian education system

(c) to build a platform where different STEM projects can display their portfolio

(d) to encourage lifelong learning

(e) to develop skills such as creativity and critical thinking which are needed in STEM but rarely taught

(f) to promote accessibility and inclusion in science by targeting traditionally underrepresented communities.

Space is a key focus of the RSF. It is a popular field, not included in the Romanian school curriculum, that is why the resources in form of the expertise and career orientation offered by our mentors are so valuable to students. Through mentorship, students discover opportunities to study and do research, while the public is fascinated by the latest discoveries in astronomy and space science and learn about the importance of investing in fundamental research. In the next section we describe in detail the activities of the science festival over the last three years.

2. Activities

2.1. Open-air science festival

The first and foremost activity of RSF is the open-air festival, organised in different cities of Romania. In 2019 we organised three such events, in the cities of Timisoara[5], Baia Mare[6] and Pitesti[7] (see Figure 1 for images from these events). The open-air science festivals attracted 20,000 members of the public and involved 450 volunteers (school students, university students, researchers, professionals) showcasing science experiments to the public. The idea behind the open-air festival was to make science accessible, fun and enjoyable. Each festival had a dedicated space component consisting of (1) an astronomy stand, (2) solar observations, (3) telescopes for demonstration, (4) astronomy showcases (such as the gravity tablecloth experiment) and (5) Space Talks[8]. We partnered with local astronomy societies, planetaria and ESERO-Romania who joined our events as demonstrators and provided educational materials to the public. In 2020, because of the COVID-19 pandemic, we had to interrupt the in-person events and the activity of the RSF moved fully online.

Figure 1. Open-air science festivals in 2019 in Timișoara (*top left*), Pitești (*top right*) and Baia Mare (*bottom right*). Paxi with the astronomy educational materials that were handed out to the public (*bottom left*).

2.2. Science webinars

The pandemic proved to be an excellent opportunity for the RSF for online activities. Since the majority of the RSF scientific community lives in the diaspora, the online presence allowed us to have a wider reach in

[5] Timișoara Science Festival
[6] Baia Mare Science Festival 2019
[7] Pitesti Science Festival 2019

[8] https://spacetalks.net/event/exoplanets-artificial-intelligence-and-citizen-science/

the country and to connect scientists to students across Romania, including in remote areas. In partnership with British Council Romania, in April 2020 we launched a series of weekly science webinars, live on the Facebook page of the festival[9]. Through these live online events, the scientists from the RSF community were able to present their field and science to a broad public, including teens and adults.

To date, 64 RSF mentors presented 58 live webinars, totalling over 75 hours of scientific content aimed at Romanian secondary schools. We promote the classical STEM disciplines such as Maths, Chemistry, Physics, Geography and Biology, as well as 'new' sciences which are not part of the Romanian school curriculum, but which are very much in trend globally, such as: Astronomy, Space Science and Exploration, Artificial Intelligence, Neuroscience, Earth Observation etc. Hence, we are encouraging the students to look beyond the classical approach to sciences, challenge them to keep pace with the current research and scientific discoveries, and be interested in science content which is relevant for tomorrow's world.

So far, there were 13 webinars on Space topics such as Solar System objects, Black Holes, Extrasolar Planets, our Galaxy, Pulsars, Mars Exploration, Building Cubesats, Planetary Habitability and Earth Observation. A list of our space webinars and speakers is below:

- Sandor Kruk (ESA, Netherlands) - "Three astronomical hypotheses for the end of the world"
- Aurora Simionescu (SRON, Netherlands) - "An expedition to the edge of a black hole"
- Cristian Ignat (UCL, UK) - "The hunt for exoplanets"
- Paula Gherghinescu (University of Surrey, UK) - "Galactic archaeology: stars as cosmic fossils"
- Alexandra Bonta (University of Manchester, UK) - "Pulsars: the chronometers of the Universe"
- Cristian Lazăr (Airbus, Germany) - "Space exploration: from ExoMars to SpaceX"
- Adrian Dumitrescu (University of Southampton, UK) - "The history of miniaturisation of satellites"
- Cristina Vrînceanu (University of Nottingham, UK) - "A journey through Earth's geosystems"
- Cătălina Mirițescu (Imperial College London, UK) - "Habitability in the Solar System"
- Alina Vizireanu (SGAC, UK) - "The role of geographic informational systems in the society"
- Marcel Popescu (Astronomical Institute of the Romanian Academy) - "To asteroids"
- Ioana Ciucă (Australian National University) – "Galactic Archaeology: A great journey through our Galaxy"
- Norbert Zicher (University of Oxford, UK): "What are exoplanets?"

The webinars were advertised on social media (see some of the advertisements in Figure 2) and have totalled over 100,000 views on Facebook, LinkedIn and Youtube. The entire content is freely available on the RSF Youtube[10] page and the webinar archive is probably the largest resource featuring scientific content presented by various experts in the Romanian language.

Figure 2. Examples of RSF live science webinars on space: Cristian Lazar (Airbus), Aurora Simionescu (SRON), Sandor Kruk (ESA).

[9]https://www.facebook.com/RomanianScienceFestival

[10]https://youtube.com/playlist?list=PLtTu_O-DejhE7CpXU6hpDtzbOc1RTBUfk

2.3. Online school visits

The period of the COVID-19 pandemic has been a challenge for both teachers and students. In April 2020, we launched a new Romanian Science Festival programme - ***Invite a RSF mentor to your online class***. Inspired by the highly successful Skype-a-Scientist[11] project, we aimed at connecting scientists from the Romanian diaspora with schools in Romania. Through this programme, the scientists had the opportunity to share their passion for science and space with children and students from the country. They also discussed about their career paths in science. The teachers could sign up via Google Forms and we paired them with scientists from the RSF community. In total, we visited 150 schools online, approximately half of them being from rural communities (see in Figure 3 a map of Romania with the locations of the schools visited). Through this activity, we reached over 2000 students from all over the country.

In Romania, half of the students study in rural settings. These have fewer opportunities to expand their knowledge horizons through extra-curricular science activities.[12] Hence, many children from underprivileged backgrounds, who otherwise would not have had such an opportunity, listened to and interacted with scientists for the first time.

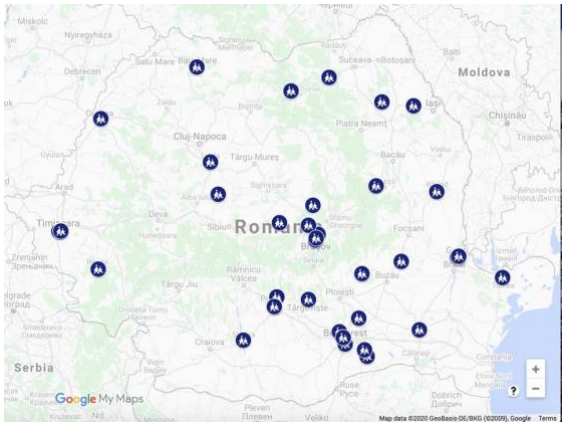

Figure 3. The location of the schools where our mentors visited online classes, during the first round of the programme.

2.4. Space Month

Using a unique moment as a window of opportunity, we organised the "Space Month at RSF" in April-May 2021. This campaign launched on the 12th April 2021, celebrating 60 years of the first man in space, Cosmonaut Yury Gagarin, and ended on 14th May 2021 with the celebration of 40 years since the first and only Romanian Cosmonaut, Dumitru Prunariu, flew in space.

During this campaign, the RSF team enabled space exploration lectures and creativity sessions for children from primary and secondary schools. 100 children were able to interact and ask questions live to Dumitru Prunariu[13]. Additionally, we created new partnerships that allowed children from Romania to participate in international creative sessions as part of the Projects Kids to Mars (InnovaSpace, UK) and Project Beyond (Space for Art Foundation, US). As part of Project Beyond, we organised a space drawing competition whose winner's, Alesia Ardelean's painting was displayed together with paintings from other countries on a spacesuit at the UN Climate Change Conference (COP26) in Glasgow.

Figure 4. The Romanian winner of the Beyond project, Alesia Ardelean, and her drawing that was displayed on the astronaut suit by the Space for Art Foundation[14].

[11] https://www.skypeascientist.com/
[12] https://worldvision.ro/wp-content/uploads/2020/11/Raport-de-Bunastare-a-Copilului-din-Mediul-Rural-2020.pdf
[13] Recording: https://youtu.be/n46EWpq_Pb0
[14] https://www.spaceforartfoundation.org/space suit-art-project

Figure 5. The programme of 'Space Month' 2022.

During April 2022 we once again organised the 'Space Month' at RSF. This time, we planned for a series of three webinars on Earth and Space and one panel discussion with five guests on the topic of 'Astronomy as a hobby' (see Figure 5). As a special event to celebrate the 32nd anniversary of the launch of the Hubble Space Telescope, we invited Dr Charlie Pellerin, former director of NASA Astrophysics, to tell our audience about building and repairing Hubble, as well as how NASA builds teams. Finally, we organised an engaging essay competition with prizes on the topic of 'space travel' for middle school students.

2.5. Plans for 2022

As the pandemic slowly goes into the endemic phase, we plan to return to in-person events. In 2022, we have partnered with the Romanian American Foundation and are planning for three new open-air science festivals in Romania. These will be complemented by 'science caravans', with mentors visiting schools in remote communities, where they make science presentations, talk to children about a career in science, interact with the teachers.

Additionally, we have partnered with the Romanian Space Initiative (ROSPIN) to organise the ROSPIN School[15], the first space school project, asking students in teams to design a Lunar Rover. Owing to the success of the online activities, we will continue to deliver high quality webinars and to visit online classrooms.

3. Discussion

RSF is the first national science festival in Romania. Through various initiatives, we aim to inspire, encourage and challenge children of all ages and from any social background to explore and understand the world around them from a scientific perspective.

Sciences are taught in Romania in a theoretical way. This has two immediate consequences. Firstly, it limits the student's level of understanding of the applicability of science. Science surrounds us and is part of our daily lives. While a theoretical way is focused on information delivery, an interactive way to experience science helps children understand its ubiquity in everyday life. Secondly, a theoretical approach triggers a student's negative attitude towards sciences. Therefore, the vast majority of students find sciences to be difficult disciplines, hard to understand and not very appealing. In the long term, this has an impact on the careers the students choose.

At RSF, we aim to reverse this trend of 'running away from science'. In our four-year experience we have noticed that students' relationship with sciences lacks two main elements. The students lack both role models and opportunities to discover various STEM disciplines. RSF aims to address these two needs. Through various initiatives, we aim to create opportunities for students to discover science in a new way, to challenge them to understand science beyond the theoretical framework, to encourage them to be inquisitive and creative and express themselves through science, to guide them in their endeavour to pursue a scientific career.

4. Conclusions

This is just the beginning of our knowledge exploration. Space education is just one exploratory mission from a series of diverse initiatives. The Romanian Science Festival story will continue to expand the knowledge horizons of children by launching new STEM initiatives, because our team is determined to create a systemic impact in education. We will continue to add new chapters, stimulating the curiosity and imagination of people fascinated by science and space.

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[15]https://rospin.org/rospin-school/